# PATENT COOPERATION TREATY PCT

### INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference AY/2007.3442	FOR FURTHER ACTION as w	see Form PCT/ISA/220 rell as, where applicable, item 5 below.				
International application No. PCT/SG2007/000398	International filing date (day/month/year) 17 November 2007	(Earliest) Priority Date (day/month/year) 17 November 2006				
Applicant AGENCY FOR SCIENCE, 7	TECHNOLOGY AND RESEARCH et al	l				
This international search report consists of	a total of 6 sheets.	and is transmitted to the applicant according to				
It is also accompanied by a co	opy of each prior art document cited in this report.					
1. Basis of the report						
	ternational search was carried out on the basis of:					
X The international ap	plication in the language in which it was filed.					
A translation of the translation furnished	international application into I for the purposes of international search (Rules 12	, which is the language of a 2.3(a) and 23.1(b)).				
b. This international search repondified to this Authority und	ort has been established taking into account the rece er Rule 91 (Rule 43.6bis(a)).	etification of an obvious mistake authorized by or				
c. With regard to any nucleotide	e and/or amino acid sequence disclosed in the int	ernational application, see Box No. I.				
2. Certain claims were found t	unscarchable (See Box No. II).					
3. X Unity of invention is lacking	(See Box No. III).					
4. With regard to the title,						
X the text is approved as submit	tted by the applicant.					
the text has been established	by this Authority to read as follows:					
5. With regard to the abstract,						
X the text is approved as submit	tted by the applicant.					
the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.						
6. With regard to the drawings,						
a. the figure of the drawings to be pul	blished with the abstract is Figure No. $oldsymbol{1}$					
X as suggested by the	X as suggested by the applicant.					
as selected by this A	uthority, because the applicant failed to suggest a	figure.				
as selected by this A	uthority, because this figure better characterizes th	e invention.				
b. none of the figures is to be pu	b. none of the figures is to be published with the abstract.					

International application No.

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)
This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:
I. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)
Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)
This International Searching Authority found multiple inventions in this international application, as follows:
See supplemental sheet
As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. X As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
Remark on Protest  The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
No protest accompanied the payment of additional search fees.

International application No.

PCT/SG2007/000398

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.

C08F 25I/00 (2006.01) A6IF 9/00 (2006.01)

G02C 7/04 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) WPIDS, JAPIO, CAPLUS; Key Words: porous, polymer, copolymer, microemulsion, emulsion, surfactant, crosslink, wetting, hyaluronic, dextran, polyvinylpyrrolidone,

#### C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2006/0235162 A1 (MULLER et al) 19 October 2006 See abstract, paragraphs 7, 26 and 96	15-17, 19, 21- 25
Y	See abstract, paragraphs 7, 26 and 96	1-25
	WO 2006/014138 A1 (AGENCY FOR SCIENCE, TECHNOLOGY AND RESEARCH) 9 February 2006	
Y	See whole document	1-25
x	US 2002/0165324 A1 (BOWERS et al) 7 November 2002 See abstract, paragraphs 4, 5 and 13	15, 21-25
-		

	X	US 2002/0165324 A1 (BOWERS e See abstract, paragraphs 4, 5 and 13		November 2002	15, 21-25	
	X Fu	orther documents are listed in the cor	tinuat	ion of Box C X See patent family ann	ex	
* "A"	documen	ategories of cited documents: t defining the general state of the art which is dered to be of particular relevance	n.Lu	later document published after the international filing date or p conflict with the application but cited to understand the princip underlying the invention		
"E"	E" earlier application or patent but published on or after the international filing date			document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone		
"L"	or which	t which may throw doubts on priority claim(s) is cited to establish the publication date of itation or other special reason (as specified)	"7"	document of particular relevance; the claimed invention cannot involve an inventive step when the document is combined with such documents, such combination being obvious to a person s	one or more other	
"O"	documen or other r	t referring to an oral disclosure, use, exhibition neans	"&"	document member of the same patent family		
"P"		t published prior to the international filing date than the priority date claimed				
		al completion of the international search		Date of mailing of the international search report	0 8 FEB 2008	
07 Ja	muary 20	008			0 0 1 C 0 7000	
Name	and maili	ng address of the ISA/AU		Authorized officer		
AUST	RALIAN	PATENT OFFICE		CATHY DOUGLAS		
PO BOX 200, WODEN ACT 2606, AUSTRALIA				AUSTRALIAN PATENT OFFICE		
		pct@ipaustralia.gov.au -61 2 6283 7999		(ISO 9001 Quality Certified Service)		
racsn	mie ivo. a	-U1 2 U203 1999		Telephone No: (02) 6283 2664		

International application No.

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to
category	Charlon of document, with indication, where appropriate, of the relevant passages	claim No.
	WO 2002/039948 A2 (N.V.R. LABS BVI) 23 May 2002	· ·
X	See abstract, page 6 lines 7-12	15, 19, 24
	US 2005/0271729 A1 (WANG) 8 December 2005	
X	See paragraphs 8 and 37	15, 19, 24, 25
	US 2005/0148682 A1 (HU et al) 7 July 2005	
X	See abstract, paragraphs 30, 32 and 57	15, 20, 21, 2 <sup>2</sup> 25
	Patent Abstracts of Japan	
X	JP 06-239942 A (ONISHI YASUHIKO) 30 August 1994 See abstract	15 20 21 2
X		15, 20, 21, 24 25
	Patent Abstracts of Japan	
X	JP 63-309914 A (MEITO SANGYO KK et al) 19 December 1988 See abstract	15 20 21 2
Α	See abstract	15, 20, 21, 20 25
	US 2007/0293648 A1 (SHEARDOWN et al) 20 December 2007	-
E, X	See abstract, paragraph 30	15, 19, 24, 2
	LEACH, Jennie B. et al, "Characterization of protein release from photocrosslinkable	
Х	hyaluronic acid-polyethylene glycol hydrogel tissue engineering scaffolds", BIOMATERIALS, 26, (2005), pages 125-135	15, 16, 19, 2
	INSUP, Noh et al, "Effects of cross-linking molecular weights in a hyaluronic acid-	
	poly(ethylene oxide) hydrogel network on its properties",	
X	BIOMEDICAL MATERIALS 1 (2006) 116-123	15, 16, 19, 2
		·

International application No.

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### Supplemental Box

(To be used when the space in any of Boxes I to IV is not sufficient)

#### Continuation of Box No: III

This International Application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept.

In assessing whether there is more than one invention claimed, I have given consideration to those features which can be considered to potentially distinguish the claimed combination of features from the prior art. Where different claims have different distinguishing features they define different inventions.

This International Searching Authority has found that there are different inventions as follows:

- Claims 1-14, directed to a method of forming a porous polymeric material and materials formed by the method. It is considered that the method of polymerizing water, a cross-linkable wetting agent, a monomer and a polymerizable surfactant in a bicontinuous microemulsion comprises a first distinguishing feature.
- Claims 15-25, directed to a porous material. It is considered that the transparent polymer matrix defining interconnected pores and having a wetting agent at least partially cross-linked with the matrix comprises a second distinguishing feature.

PCT Rule 13.2, first sentence, states that unity of invention is only fulfilled when there is a technical relationship among the claimed inventions involving one or more of the same or corresponding special technical features. PCT Rule 13.2, second sentence, defines a special technical feature as a feature which makes a contribution over the prior art.

The only feature common to all of the claims is a porous polymeric material having a wetting agent crosslinked into the matrix. However this concept is not novel in the light of the citations.

This means that the common feature can not constitute a special technical feature within the meaning of PCT Rule 13.2, second sentence, since it makes no contribution over the prior art.

Because the common feature does not satisfy the requirement for being a special technical feature it follows that it cannot provide the necessary technical relationship between the identified inventions. Therefore the claims do not satisfy the requirement of unity of invention *a posteriori*.

Information on patent family members

International application No.

PCT/SG2007/000398

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report				Pate	nt Family Member		
US	2006235162	AR	029901	AU	60143/01	BR	0109416
		CA	2401865	CN	1419656	EP	1266246
		MX	PA02009352	NO	20024557	US	7091283
		US	7238750	US	7268189	US	2001037001
		US	2006160957	WO	0171392	ZA	200207477
wo	2006014138	CN	101018814	EP	1773893	US	2007154522
US	2002165324	EP	0555295	HK	53297	JP	9020814
		SG	43188	US	6420453	US	6423761
		WO	9207885				
WO	0239948	AU	23995/02	CA	2428748	EP	1339349
		US	2005260753	US	2006024373		
US	2005271729	EP	1753787	WO	2005113608		
US	2005148682	AU	49801/99	EP	1095076	US	7279507
		US	2001044482	WO	0002937		
JP	6239942	NONE					
JP	63309914	NONE					
US	2007293648	NONE				· · · · · · · · · · · · · · · · · · ·	

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

**END OF ANNEX** 

### PATENT COOPERATION TREATY

From the: INTERNATIONAL SEARCHING AUTHORITY			
To:			PCT
Yu Sarn Audrey & Partners 190 Middle Rd, #12-04 Singapore 188979			TTEN OPINION OF THE DNAL SEARCHING AUTHORITY
			(PCT Rule 43bis.1)
		Date of mailing (day/month/year)	0 8 FEB 2008
Applicant's or agent's file reference AY/2007.3442		FOR FURTHER AC	TION See paragraph 2 below
International application No. Inte	rnational filing date	(day/month/year)	Priority date (day/month/year)
PCT/SG2007/000398 17	November 2007	r S	17 November 2006
International Patent Classification (IPC) or both	national classifica	ation and IPC	
Int. Cl.			
C08F 251/00 (2006.01) A61F	9/00 (2006.01)	G02C 7/04 (2006	.01)
Applicant			
AGENCY FOR SCIENCE, TECHNO	DLOGY AND R	ESEARCH et al	-
1. This opinion contains indications relating t	o the following it	ems:	
X Box No. 1 Basis of the opinion	C		
X Box No. II Priority			
	inion with reased to	novalty inventive ctan	and industrial applicability
	_	movery, inventive step	and industrial appreadmity
	er Rule 43 <i>bis</i> .1(a)(i		inventive step or industrial applicability;
citations and explanation  X Box No. VI Certain documents cited		tatement	
Box No. VII Certain defects in the int		on.	•
1	the international ap	prication	
If a demand for international preliminary exam	scept that this does I the International B I. ed to be a written of In amendments, befor	not apply where the appureau under Rule 66.1bi pinion of the IPEA, the appure the expiration of 3 m	applicant is invited to submit to the IPEA a onths from the date of mailing of Form
	220		
3. For further details, see notes to Form PCT/ISA/2	.20.		
Name and mailing address of the ISA	Date of compl	ction of this opinion	Authorized Officer
AUSTRALIAN PATENT OFFICE		. F	CATHY DOUGLAS
PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au	07.	2008	AUSTRALIAN PATENT OFFICE
Facsimile No. +61 2 6283 7999	07 January	2008	(ISO 9001 Quality Certified Service)
			Telephone No. (02) 6283 2664

International application No.

Box [	No. I Basis of this opinion	1
1.	With regard to the language, this opinion has been established on the basis of:	
[	X The international application in the language in which it was filed	
[	A translation of the international application into, translation furnished for the purposes of international search (under Rules 12.3(a) and 23.1(b)).	
2. [	This opinion has been established taking into account the rectification of an obvious mistake authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))	
	With regard to any nucleotide and/or amino acid sequence disclosed in the international application, this opinion has been established on the basis of:	
	a. type of material	
	a sequence listing	
	table(s) related to the sequence listing	***************************************
	b. format of material	
	on paper	
	in electronic form	
	c. time of filing/furnishing	
	contained in the international application as filed.	
	filed together with the international application in electronic form.	
	furnished subsequently to this Authority for the purposes of search.	
4.	In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.	
5.	Additional comments:	

International application No.

Bo	ox No. II Priority	
1.	The validity of the priority claim has not been considered because the International Searching Authority does not have its possession a copy of the earlier application whose priority has been claimed or, where required, a translation of the earlier application. This opinion has nevertheless been established on the assumption that the relevant date (Rules 43bis.1 and 64.1) is the claimed priority date.	ve in lat
2.	This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been for invalid (Rules 43 bis.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above considered to be the relevant date.	ound is
3.	Additional observations, if necessary:	
	The right to the priority claim is found to be valid.	

International application No.

Box	No. IV L	ack of unity of invention
1.	In respo	onse to the invitation (Form PCT/ISA/206) to pay additional fees the applicant has, within the applicable time
	pa pa	aid additional fees
	pa	aid additional fees under protest and, where applicable, the protest fee
	pa	aid additional fees under protest but the applicable protest fee was not paid
	no	ot paid additional fees
2.		uthority found that the requirement of unity of invention is not complied with and chose not to invite the nt to pay additional fees.
3.	This Authority	y considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is
	complie	ed with
	X not con	nplied with for the following reasons:
		national Application does not comply with the requirements of unity of invention because it does not relate to tion or to a group of inventions so linked as to form a single general inventive concept.
	considered	ng whether there is more than one invention claimed, I have given consideration to those features which can be d to potentially distinguish the claimed combination of features from the prior art. Where different claims have listinguishing features they define different inventions.
	This Inter	national Searching Authority has found that there are different inventions as follows:
-	I	Claims 1-14, directed to a method of forming a porous polymeric material and materials formed by the method. t is considered that the method of polymerizing water, a cross-linkable wetting agent, a monomer and a polymerizable surfactant in a bicontinuous microemulsion comprises a first distinguishing feature.
	i	Claims 15-25, directed to a porous material. It is considered that the transparent polymer matrix defining interconnected pores and having a wetting agent at least partially cross-linked with the matrix comprises a second listinguishing feature.
	PCT Rule the claime	13.2, first sentence, states that unity of invention is only fulfilled when there is a technical relationship among ed inventions involving one or more of the same or corresponding special technical features. PCT Rule 13.2, intence, defines a special technical feature as a feature which makes a contribution over the prior art.
		feature common to all of the claims is a porous polymeric material having a wetting agent crosslinked into the owever this concept is not novel in the light of the citations.
	This mear second se	ns that the common feature can not constitute a special technical feature within the meaning of PCT Rule 13.2, intence, since it makes no contribution over the prior art.
	provide th	he common feature does not satisfy the requirement for being a special technical feature it follows that it cannot ne necessary technical relationship between the identified inventions. Therefore the claims do not satisfy the ent of unity of invention a posteriori.
4.	Consequently,	this opinion has been established in respect of the following parts of the international application:
	X all par	ts
	the par	rts relating to claims Nos.

International application No.

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Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

#### 1. Statement

Novelty (N)	Novelty (N)	Claims	1-14, 18	YES
		Claims	15-17, 19-25	NO
	Inventive step (IS)	Claims		YES
		Claims	1-25	NO
	Industrial applicability (IA)	Claims	1-25	YES
		Claims		NO

### 2. Citations and explanations:

**D1** US 2006/0235162; **D2** WO 2006/014138; **D3** US 2002/0165324; **D4** WO 2002/039948; **D5** US 2005/0271729; **D6** US 2005/0148682; **D7** JP 06-239942; **D8** JP 63-309914; **D9** US 2007/0293648;

D10 LEACH, Jennie B. et al, "Characterization of protein release from photocrosslinkable hyaluronic acid-polyethylene glycol hydrogel tissue engineering scaffolds", BIOMATERIALS, 26, (2005), pages 125-135

**D11** INSUP, Noh et al, "Effects of cross-linking molecular weights in a hyaluronic acid-poly(ethylene oxide) hydrogel network on its properties", BIOMEDICAL MATERIALS. 1 (2006) 116-123

### NOVELTY (N)

D1 discloses copolymers suitable for contact lenses. The copolymers have a hydrophilic monomer which may be any mono-unsaturated compound comprising a substituent. The substituent may be hyaluronic acid (see paragraph 26 line 11), which is a wetting agent within the meaning of the claims. The copolymers are further reacted with an organic compound such as HEMA. Since the polymers are used for contact lenses, transparency and porosity are considered inherent. Thus, D1 destroys the novelty of claims 15-17, 19 and 21-25.

D3 discloses copolymers for contact lenses comprising a diluent monomer and a monomer having a positive charge. The latter monomer is considered to be a "wetting agent" within the meaning of the claims since its effect is to reduce lens water loss. The diluent monomer may be HEMA. The polymers are transparent, and porosity is considered inherent as the polymer is formed into a lens which must be porous to some degree. Thus, D1 destroys the novelty of claims 15 and 21-25.

D4 discloses cross-linked hyaluronic acid-laminin gels. The degree of cross-linking is disclosed to determine porosity and other "desirable properties". Transparency is considered to fall within these properties. Thus, D4 destroys the novelty of claims 15, 19 and 24.

D5 discloses a product comprising hyaluronan cross linked to chitosan. The product can be used for contact lenses, is transparent, and porosity is considered inherent. Further, the polymer films can be used to entrap drugs. Thus, D5 destroys the novelty of claims 15, 19, 24 and 25.

D6 discloses an interpenetrating polymer network hydrogel for use in contact lenses, made by polymerizing monomers and non-ionic polymer, the latter including polyvinylpyrrolidone, which is a wetting agent within the meaning of the claims. The monomers may be HEMA. Thus, D6 destroys the novelty of claims 15, 20, 21, 24 and 25.

International application No.

Box No. VI	Certain document	ts cited		
1. Certain pub	lished documents (R	ules 43bis.1 and 70.10)		
Applicati <u>Paten</u>	ion No. <u>ut No.</u>	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (valid claim) (day/month/year)
US 2007/02	293648 A1	20 December 2007	27 April 2007	28 April 2006
		aluronic acid containing b res of claims 15, 19, 24 ar		retained by crosslinking, useful for
contact lenses.	. Thus, an the leatu	nes of Clauns 13, 13, 24 an	na 25 are disclosed.	
2. Non-writter	n disclosures (Rules 4	43 <i>bis</i> .1 and 70.9)		
Kind of no	on-written disclosure		vritten disclosure onth/year)	Date of written disclosure referring to non-written disclosure (day/month/year)

International application No.

PCT/SG2007/000398

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

- a) Claims 6 and 20 lack clarity. It is not clear whether "said wetting agent" in these claims only refers to unbonded wetting agent, or whether PVP and dextran can be cross-linkable wetting agents. It appears from the description that PVP and dextran are unbonded wetting agents (see paragraph 29).
- b) Claim 15 is not fully supported by the description, in that the description only envisages products made by the process of claim 1, whereas claim 15 does not require that the products are made by polymerizing a bicontinuous emulsion using a copolymerizable surfactant.

) UU.TT PAA "UL A UAUU AULU II MUUIKA

FI OTO A OTO

### WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International Application No.

PCT/SG2007/000398

### Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Box No. V

Each of D7 and D8 disclose polymers useful for contact lenses made by polymerizing a dextran derivative and an unsaturated acid monomer. Dextran is a wetting agent within the meaning of the claims. Transparency and porosity are considered inherent. Thus, each of D7 and D8 destroy the novelty of claims 15, 20, 21, 24 and 25.

D9 was published after the International Filing Date of the present application - see Box VI.

D10 discloses hyaluronic acid-polyethylene glycol hydrogels. The gels are considered inherently porous and transparent. Thus, D10 destroys the novelty of claims 15, 16, 19 and 24.

D11 discloses porous hyaluronic acid-polyethylene oxide hydrogels, which are considered inherently transparent. Thus, D11 destroys the novelty of claims 15, 16, 19 and 24.

None of D1 or D3-D11 discloses the method of forming a porous polymeric material comprising a crosslinkable wetting agent as defined in claim 1, or a porous, transparent polymer matrix comprising a crosslinked wetting agent and in addition an unbonded wetting agent as defined in claim 18, thus claims 1-14 and 18 are considered novel in view of these documents.

### **INVENTIVE STEP (IS)**

Claims 15-17 and 19-25 are lacking in novelty as above, therefore the subject matter of these claims is also obvious and does not meet the requirements of Article 33(3) of the PCT with regard to inventive step.

D2 discloses a transparent, porous polymer formed from a bicontinuous microemulsion of water, monomer and copolymerizable surfactant. The microemulsion further comprises a drug which is dispersed in the formed polymer or the pores thereof. Paragraph 41 discloses that the drug may be a lubricating agent.

D1 discloses that hyaluronic acid can be polymerized into a copolymer via a mono-unsaturated compound. Thus, it is considered obvious in the light of the combined teachings of D1 and D2 to form a porous product by the method disclosed in D2 with the addition of a cross linkable wetting agent as disclosed in D1. It is also considered obvious to include further unbonded wetting agent into the polymer, since D2 discloses that lubricating agents can be incorporated into the polymer. Dextran, polyvinyl pyrrolidone and hyaluronic acid are well known lubricants (wetting agents) for contact lenses. Thus, claims 1-25 lack an inventive step in view of the obvious combination of D1 and D2.